# FINAL

# SOIL VAPOR SURVEY WORK PLAN

# SUBSURFACE INTERIM MEASURES/ INTERIM REMEDIAL ACTION 903 PAD, MOUND, AND EAST TRENCHES AREAS

## OPERABLE UNIT NO. 2


U.S. DEPARTMENT OF ENERGY

Rocky Flats Plant
Golden, Colorado



Document No. 21000-WP-OU02.06


## ENVIRONMENTAL RESTORATION PROGRAM

12 January 1993

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# LIST OF ACRONYMS

| | |
|---|---|
| C | celsius |
| CFR | Code of Federal Regulations |
| DNAPL | dense nonaqueous phase liquid |
| DQO | data quality objectives |
| ECD | electron capture detector |
| EPA | Environmental Protection Agency |
| FFACO | Federal Facility Agreement and Consent Order |
| GC/MS | gas chromatograph/mass spectroscope |
| HASP | health and safety plan |
| IAG | Inter-Agency Agreement |
| IHSS | individual hazardous substance site |
| IM/IRA | Interim Measures/Interim Remedial Action |
| mg/ℓ | milligrams per liter |
| mℓ | milliliter |
| NIOSH | National Institute for Occupational Safety and Health |
| OSHA | Occupational Safety and Health Administration |
| OU2 | Operable Unit No. 2 |
| PCE | tetrachloroethylene |
| PID | photoionization detector |
| ppbV | part per billion (volume basis) |
| ppmV | part per million (volume basis) |
| QAPP | Quality Assurance Project Plan |
| QC | quality control |
| RF | response factor |
| RFP | Rocky Flats Plant |
| RI | remedial investigation |
| RPD | relative percent difference |
| SOP | standard operating procedures |
| SVS | soil vapor survey |
| SVE | soil vapor extraction |
| TCE | trichloroethylene |
| VOC | volatile organic compounds |

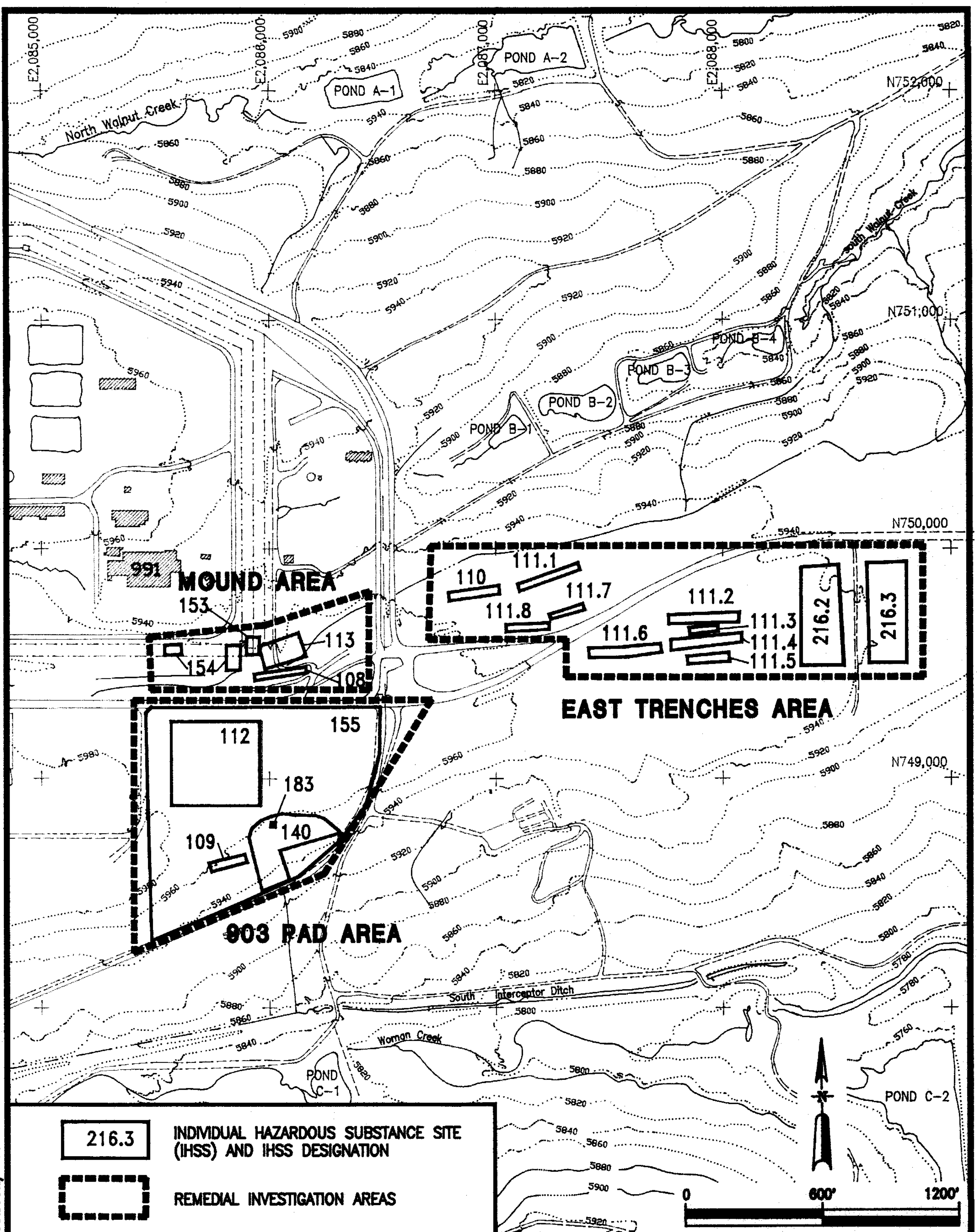
# SECTION 1
# INTRODUCTION

## 1.1 BACKGROUND

The final Subsurface Interim Measures/Interim Remedial Action (IM/IRA) Plan/Environmental Assessment (EG&G, 1992) addresses removal of residual free-phase volatile organic compound (VOC) contamination suspected in the subsurface within an area identified as Operable Unit No. 2 (OU2) (Figure 1-1) of the Rocky Flats Plant (RFP). The term "residual" free-phase refers to the non-aqueous phase contamination remaining in the soil matrix (by capillary force) subsequent to the passage of dense non-aqueous-phase liquid (DNAPL) through the subsurface. The terms "source area" and "source material" are also used to refer to the source for dissolved contaminant ground-water plumes present at OU2. The proposed free-phase VOC-removal actions involve pilot testing soil vapor extraction (SVE) technology at three different hydrogeologic settings at OU2. The three unique hydrogeologic settings selected for pilot testing are located within the 903 Pad, Mound and East Trenches Areas, respectively.

As discussed in the Subsurface IM/IRA Plan, the precise locations for SVE pilot testing will be determined from the Phase II Remedial Investigation (RI) data and results of soil vapor surveys (SVS) to be conducted pursuant to this Work Plan. Based on all OU2 RI data available to date, Individual Hazardous Substance Site (IHSS) Nos. 110, 112, and 113 (Figure 1-2) are currently being retained as the three primary sites for SVE pilot testing. SVS data will thus be collected at these three primary IHSSs in order to optimize the locations for the vapor extraction wells. Per U.S. Environmental Protection Agency (EPA) Observational/Streamlined Approach methodology; however, this Work Plan also describes SVSs that may be performed at two contingency sites at OU2 (IHSSs Nos. 109 and 111.1). The contingency sites are retained in the event that soil gas VOC concentrations at one or more of the primary sites are not sufficiently high enough to indicate the feasibility of SVE pilot testing.

It should be noted that the final Subsurface IM/IRA Plan (EG&G, 1992) and draft Pilot Test Plan (EG&G, 1993) indicate that an SVE pilot test will be conducted at IHSS No. 111.1 located within the East Trenches Area. Phase II RI data which became available since the IM/IRA Plan

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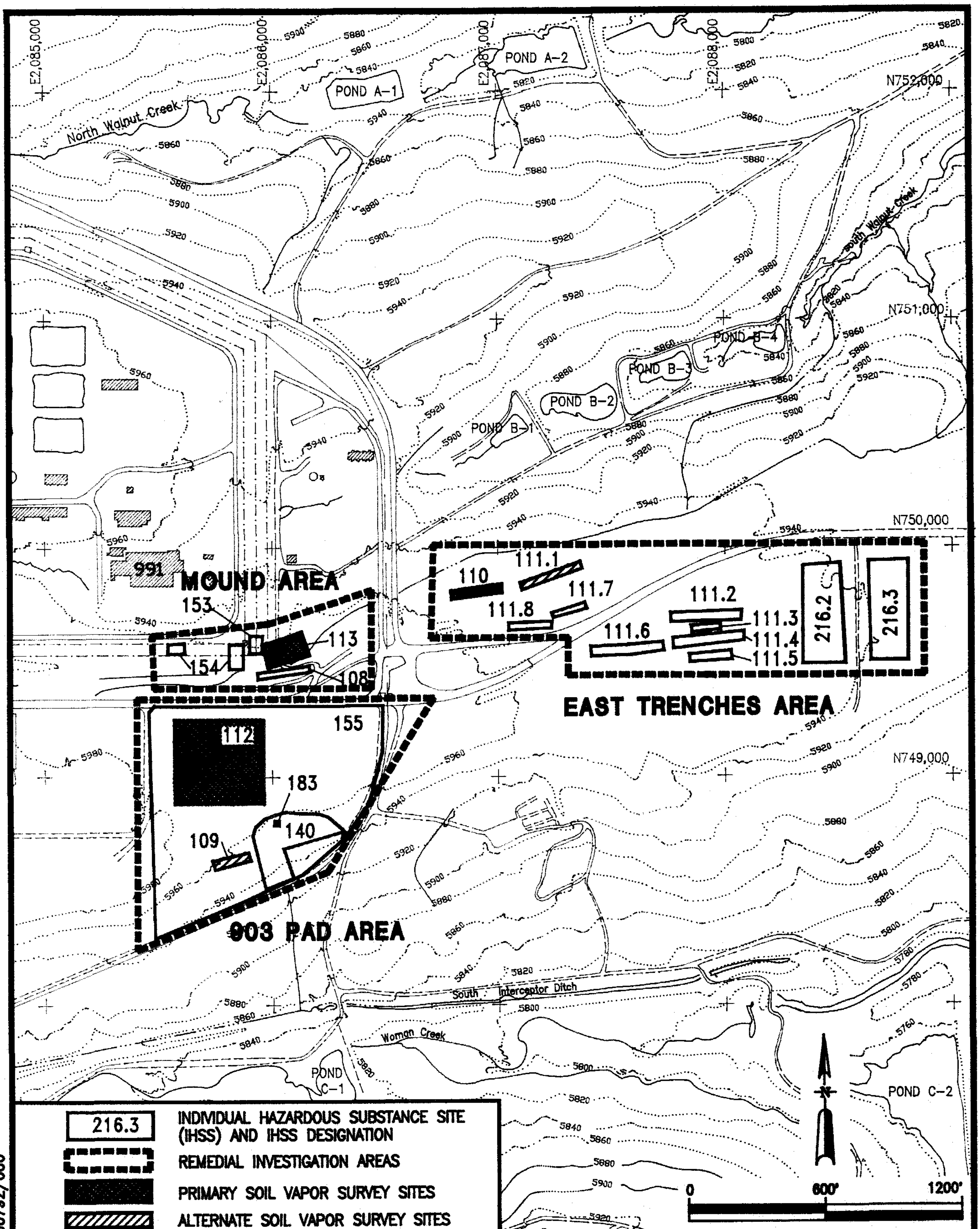
| U.S. DEPARTMENT OF ENERGY<br>Rocky Flats Plant<br>Golden, Colorado | SITE MAP OF REMEDIAL INVESTIGATION AREAS AND INDIVIDUAL HAZARDOUS SUBSTANCE SITES<br>OPERABLE UNIT NO. 2 | FIGURE<br>1-1 |
|---|---|---|

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| U.S. DEPARTMENT OF ENERGY<br>Rocky Flats Plant<br>Golden, Colorado | SOIL VAPOR SURVEY SITES<br>OPERABLE UNIT NO. 2 | FIGURE<br>1-2 |
|---|---|---|

was finalized revealed the presence of over 10,000 mg/kg of tetrachloroethylene (PCE) in a soil sample collected 3 feet below IHSS No. 110, located approximately 100 feet to the west of IHSS No. 111.1. This SVS Work Plan therefore proposes to first investigate IHSS No. 110. If the results of the SVS further indicate that IHSS No. 110 will provide an adequate pilot test site, the detailed design of the SVE pilot system will be modified to reflect this change.

## 1.2 PURPOSE

The purpose of the SVS presented in this Work Plan is to provide "screening level" information that may be used to approximate the locations of VOC source areas at each of the three test sites, if present, and to guide the placement of the pilot unit vapor extraction wells. It is important to emphasize that the proposed SVS program is not a site characterization effort that is intended to define the areal and vertical extent of VOCs in the different IHSSs.

The SVS Program described in this Work Plan involves collection and analysis of shallow soil gas from 3 to 5 feet below the ground surface. Sample depth may be limited by the presence of cobbles in the subsurface and cannot be exactly specified at each location. Soil gas samples will be analyzed in a mobile laboratory unit with a gas chromatograph (GC). The analytical results will be used to map the concentration of VOCs in the soil gas, and to assist in the identification of source areas.

The SVS is an effective way to map subsurface VOCs. VOCs that are adsorbed to soils, or are present as residual free-phase, will diffuse into soil gas. VOCs will also partition out of ground water at a rate proportional to their Henry's Law constant. Once in the vapor phase, the VOCs diffuse vertically and horizontally through the soil to the ground surface where they dissipate into the atmosphere. Typically, a concentration gradient develops between the source area and the ground surface. Thus, relatively high soil gas VOC levels at or near the ground surface may be indicative of a local source area.

## 1.3 SCOPE

The SVS program includes three primary tasks, each of which are described in detail in Sections 3 and 4 of this Work Plan.

- Identification of field sampling locations (i.e., sampling grids).
- Soil vapor sampling and analysis.
- Evaluation of analytical results and reporting.

This Work Plan describes both essential and non-essential components of an SVS. Work requirements include meeting Data Quality Objectives (DQOs) and are so specified in Section 3 of this Work Plan. Non-essential components may include equipment type and sample collection procedures. Many different methods and types of equipment are currently employed by SVS subcontractors and may be substituted for those described in the Work Plan as long as they achieve the DQOs. The Work Plan has been prepared in this manner to permit competitive bidding between subcontractors who use different SVS techniques with equivalent performance.

A standard operating procedure (SOP) will be prepared by EG&G based on actual methodologies proposed by the selected SVS subcontractor.

## 1.4 PROJECT SCHEDULE

A proposed schedule for the planning and implementation of the SVS at OU2 is presented in Table 1-1. Table 1-1 presents specific completion dates for project activities leading up to the commencement of the SVS. Due to the uncertainty associated with the actual length of time that will be required to complete the SVS, estimated time durations are listed in lieu of specific completion dates for activities conducted subsequent to "Begin SVS."

## Table 1-1

**Proposed Schedule - Soil Vapor Survey**
**Subsurface IM/IRA**
**Operable Unit No. 2**

| Activity | Date |
|---|---|
| Submit Draft SVS Work Plan to EPA/CDH | 29 October 1992 |
| EPA/CDH Comments on Draft SVS Work Plan | 26 November 1992 |
| Submit Final SVS Work Plan to EPA/CDH | 12 January 1993 |
| Begin SVS | 19 February 1993 |
| Submit Final SVS Report to EPA/CDH | 22 weeks after SVS is completed. |

## 1.5 WORK PLAN ORGANIZATION

Section 2 of this Work Plan describes each of the locations to be surveyed and the criteria and rationale for the site sampling grid designs. Section 3 presents the SVS Program approach including DQOs, field sampling procedures, and analytical methods. Section 4 presents the methods to be used to evaluate and report the data collected during implementation of the SVS Program. Appendix A presents the Quality Assurance procedures that will be followed during conduct of the SVS Program.

# SECTION 2
# SITE DESCRIPTION

OU2 is defined in the Federal Facility Agreement and Consent Order (FFACO), otherwise known as the Inter-Agency Agreement [IAG]) (DOE,1991) as an area comprised of 20 IHSSs that are known in aggregate as the 903 Pad, Mound, and East Trenches Areas. These Areas are located east-southeast of the RFP (Figures 1-1 and 1-2), and lie within either the Woman Creek or South Walnut Creek drainage basins.

Selection of the proposed SVS test sites was based on historical waste disposal information and test site conditions extrapolated from quantitative chemical and hydrogeologic data collected near the proposed test sites. These data suggest the presence of source material associated with the dissolved contaminant ground-water plumes.

The primary sites for the SVS Program are: the 903 Pad (IHSS No. 112); Mound Area (IHSS No. 113), and East Trenches Area (IHSS No. 110). If the SVS data for these sites do not meet the selection criteria for a vapor extraction pilot test, the following alternate sites will be investigated: IHSS Nos. 109 and 111.1. The SVSs will be conducted on the three primary sites initially and the results compared with success criteria outlined in Section 3. If one or more of the sites fail to meet the success criteria, the alternate site(s) will be surveyed.

Descriptions of all IHSSs selected for the SVS are presented in the following sections. The descriptions include discussions of past and present use, hydrogeology, and contaminant type and distribution.

## 2.1 903 PAD AREA (IHSS No. 112)

IHSS No. 112, the former drum storage area at the 903 Pad, experienced a reported release of approximately 5,000 gallons of fluid including hydrocarbon oils, carbon tetrachloride, hydraulic oils, vacuum pump oils, trichloroethylene (TCE) and PCE (Rockwell, 1987). Carbon tetrachloride has been detected in ground water downgradient of the 903 Pad (EG&G, 1992).

The suspected locations of fluids released at the 903 Pad were determined by review of aerial photographs which reveal former drum storage locations and areas of stained soils.

Section 4.3.1.2 of the Subsurface IM/IRA Plan presents an idealized conceptual hydrogeologic and contaminant distribution model for IHSS No. 112, based on results of Phase I and II RI data. The data indicate that alluvial sand and gravel may extend to approximately 18 feet below ground surface (bgs) in the vicinity of the 903 Pad Area, and that the alluvium may contain unconfined ground water perched on bedrock with a saturated thickness of approximately 4 feet. This thickness may vary seasonally. The alluvium overlies claystone bedrock that may contain isolated or interconnected fractures (EG&G, 1990).

It is expected that carbon tetrachloride comprises the majority of the released contamination at IHSS No. 112 with lesser amounts of TCE and PCE. The conceptual model indicates that these DNAPLs may have migrated through the vadose zone and the saturated alluvium, coming to rest in structural depressions on the underlying claystone bedrock surface. The DNAPL may have also infiltrated bedrock fractures.

## 2.2 ALTERNATE 903 PAD AREA SITE (IHSS No. 109)

The alternate SVS site for the 903 Pad Area is IHSS No. 109, a burial trench located approximately 300 feet south of the 903 Pad. It is believed that IHSS No. 109 (Trench T-2) was used from approximately 1969 to 1971 for the disposal of nonradioactive liquid wastes. After radiation screening, solvents which were found to be nonradioactive were disposed in the trench. The solvents were disposed in small quantities and may have included PCE, TCE, carbon tetrachloride, paint thinner and small quantities of construction related chemicals.

Boring 7391, located approximately 60 feet south of Trench T-2, was advanced as part of the Phase II RI. The log of boring 7391 indicates that the geology consists of unsaturated, clayey and sandy gravel over claystone bedrock which was encountered at 8.1 feet bgs. Phase II RI analytical data are currently not available, however, a review of soil chemistry data presented in the Phase I RI (Rockwell, 1987) revealed the presence of 16 mg/kg of TCE in soils directly adjacent to Trench T-2. In addition, a TCE isoconcentration contour map presented in the

Subsurface IM/IRA Plan (EG&G, 1992) shows a dissolved TCE ground-water plume apparently originating in the area around this trench. The presence of soil and ground-water contamination in this area coupled with a history of solvent disposal that suggests that Trench T-2 may be a source area for TCE contamination in this section of the 903 Pad Area.

## 2.3 MOUND AREA (IHSS No. 113)

IHSS No. 113 was used to store an estimated 1,405 drums containing primarily depleted uranium- and beryllium-contaminated lathe coolant (a mixture of hydraulic oil and carbon tetrachloride). Some drums were reported to contain PCE. Ground-water samples collected downgradient of the Mound Area contained PCE, suggesting that leakage from these drums may have occurred. Soil contamination at the Mound Area (IHSS No. 113) is expected to be limited to PCE and carbon tetrachloride.

Results from drilling of exploratory boreholes and ground-water monitoring near the test site were used to construct a conceptual model of the site hydrogeology and contaminant type and distribution. This model is presented in Section 4.4.1.2 of the Subsurface IM/IRA Plan (EG&G, 1992). This model indicates that sand and gravel alluvium extends to approximately 10 feet bgs and overlies claystone bedrock that may contain isolated or interconnected fractures. The alluvium is expected to be dry but may contain a small amount of seasonal ground water perched on the underlying claystone bedrock. Results of ground-water quality analyses of wells adjacent to IHSS No. 113 indicate that PCE comprises the majority of the VOC contamination in this area with lesser amounts of carbon tetrachloride present. The conceptual model assumes that free-phase PCE released at IHSS No. 113 infiltrated the alluvium and may have formed pools on the claystone bedrock. The alluvium may also contain residual DNAPL.

An alternate SVS site within the Mound Area has not been identified for inclusion in this Work Plan.

## 2.4 EAST TRENCHES AREA (IHSS No. 110)

The East Trenches Area consists of nine burial trenches and two spray irrigation areas. The trenches were used from 1954 to 1968 for disposal of depleted uranium; flattened, depleted uranium- and plutonium-contaminated drums; and sanitary sewage sludge. The wastes have not been disturbed since their burial. IHSS No. 110 (Trench T-3) was used primarily for the disposal of sanitary wastewater treatment plant sludge. The sludge disposed in the trench consisted of concentrated organic matter typically found in sanitary wastewater treatment plant sludge. Uranium contamination may also be present as a result of contaminated, flattened drums that may have been disposed in the trench. Disposal operations at Trench T-3 were conducted during the period of July 2, 1955 through August 14, 1968.

The log of a shallow borehole (2791) advanced as part of the Phase II RI and located 50 feet north of the east end of the trench was examined. The geology consists of 12.9 feet of unsaturated, sandy gravel alluvium over a sandy/clayey siltstone bedrock. The log of bedrock well No. 12191 located 15 feet south of the east side of the trench indicates 15 feet of unsaturated, sandy gravel alluvium over silty sandstone to 27.5 feet bgs where ground water is first encountered. A layer of sandstone is encountered between 27.5 feet and 35 feet underlain by clayey sandstone. The total depth of the well is 37 feet.

Preliminary chemical data on soil samples collected as part of the Phase II RI reveal the presence of several chlorinated solvents. A soil sample collected at 3 feet below ground surface during the advancement of a boring (No. 10191) through the west end of Trench T-3, contained PCE at 13,000 mg/kg and lesser amounts of TCE, carbon tetrachloride and chloroform. Contaminant concentrations were found to decrease with depth in this boring. The high concentration of PCE in the soil suggests the presence of DNAPL.

## 2.5 ALTERNATE EAST TRENCHES AREA SITE (IHSS No. 111.1)

The alternate SVS site for the East Trenches Area is IHSS No. 111.1, a burial trench located approximately 100 feet east of IHSS No. 110. IHSS No. 111.1 is also known as Trench T-4.

One exploratory boring (boring 10291) was advanced through T-4 as part of the Phase II RI approximately 25 feet east of the western end of the trench. The geologic log of this boring describes sandy gravel alluvium to a depth of 18 feet. The alluvium is underlain by silty sandstone to a depth of 34 feet which is underlain by interbedded sandstone, silty sandstone, sandy siltstone and an occasional layer of claystone (interbeds are on the order of 5 feet in thickness). This interbedded interval is primarily sandstone and extends from 34 feet to at least 60 feet, which is the total depth of borehole 10291. Lithologies beyond the total depth of borehole 10291 were extrapolated from a deeper boring (No. B217589) drilled in 1989 approximately 50 feet southeast of borehole 10291. The log of this boring describes the interval between 60 and 160 feet as primarily claystone. Based on the log of boring 10291 and historical ground-water level data from monitoring well 3687 (located just north of T-4), unconfined ground water is expected to be encountered at approximately 35 feet below ground surface in the sandstone. An idealized conceptual geologic model based on the logs of borings 10291, B217589, and others is presented in Section 4.5.1.2 of the Subsurface IM/IRA Plan (EG&G, 1992).

TCE is expected to be the primary contaminant at this site. Although soil samples collected during the advancement of boring 10291 contained relatively low concentrations of TCE, higher levels of contamination may be present in other portions of the trench. A sample of water collected in May 1988 from monitoring well 3687 located approximately 40 feet north of the trench contained 221.8 milligrams per liter (mg/$\ell$), which represents approximately 20 percent of the TCE solubility limit. This well is screened in the sandstone bedrock. The high concentration of TCE within 40 feet of IHSS No. 111.1 suggests the presence of residual, free-phase TCE in geologic materials underlying this burial trench. The conceptual model indicates that DNAPL may have migrated downward through the unsaturated alluvium and sandstone leaving a zone of residual, free-phase solvent. The solvent may have also migrated downward through the saturated zone and pooled in structural depressions on the underlying claystone, and may have migrated short distances in the claystone through the fractures.

# SECTION 3
# SOIL VAPOR SURVEY PROGRAM

This section presents the technical elements of the SVS Program. These elements include Data Quality Objectives (DQOs), development of sampling locations for the three primary and two alternate SVS sites. Field sampling procedures, on-site laboratory analysis, and a list of suggested and required equipment are presented, as well as decontamination procedures and requirements for management of investigation derived wastes.

## 3.1 APPROACH

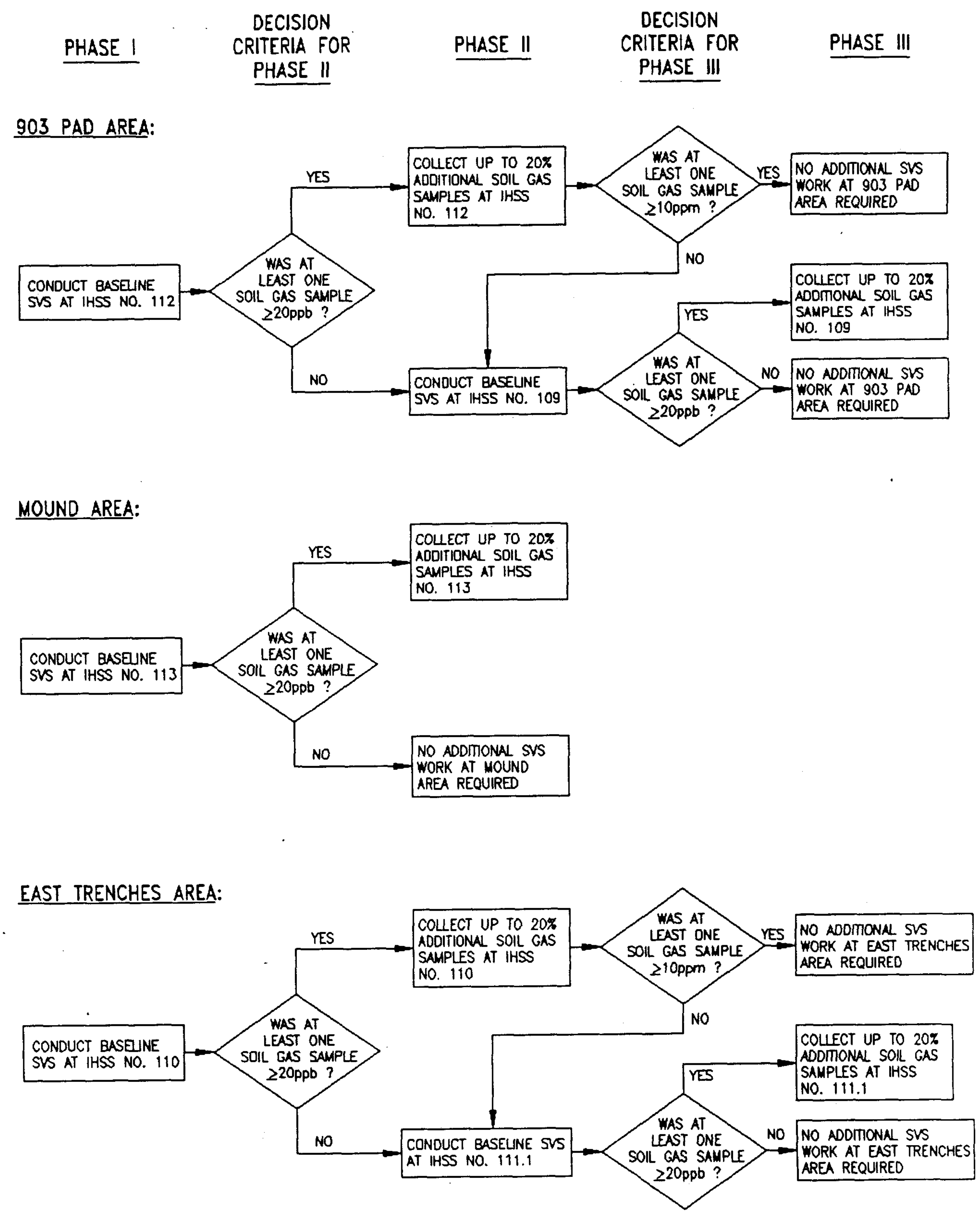
The SVS will be implemented using a phased approach that is graphically illustrated on Figure 3-1. A baseline survey will be conducted at the three primary sites. If contaminants are detected ($\geq$ 20 ppbv) in any samples, additional samples will be taken around that sampling point(s) to better pinpoint the source of the contamination. If no contaminants are detected, the site will be abandoned and a baseline survey conducted at the alternate site. If at any location, the cumulative concentration of all analytes equals or exceeds 10 ppmv, the site will be considered adequate for the vapor extraction pilot test. If this occurs at the primary site, the corresponding alternate site will not be surveyed.

The criteria for determining whether a site is adequate for executing a vapor extraction pilot test essentially reduces to one issue; whether the SVS results suggest high enough contaminant concentrations in the subsurface to justify the pilot test effort. This is a somewhat subjective determination, and the final decision will be made by the EG&G Project Manager. The selection of 10 ppmv as a tentative threshold criteria for success is loosely based on the success criteria (1 pound of total chlorinated hydrocarbons per day, EG&G 1993) for the SVE pilot tests.

## 3.2 DATA QUALITY OBJECTIVES

The project DQOs have been developed per EPA guidance, and include the following six data quality elements:

- Data uses/users.

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| U.S. DEPARTMENT OF ENERGY<br>Rocky Flats Plant<br>Golden, Colorado | OBSERVATIONAL STREAMLINED APPROACH<br>GUIDANCE FOR SVS PROGRAM<br>OPERABLE UNIT NO. 2 | FIGURE<br>3-1 |
|---|---|---|

- Data types.
- Data quality.
- Data quantity.
- Sampling and analysis approach.
- PARCC parameters (precision, accuracy, representativeness, completeness, and comparability).

The project-specific requirements for each of the data quality elements listed above are presented in Table 3-1.

## 3.3 SAMPLING GRIDS

The first phase of the SVS Program involves locating soil vapor sampling points at the primary test sites (IHSS Nos. 112, 113, and 110) as specified by the baseline sampling grids. The baseline sampling grids include 30-foot sampling intervals and are illustrated in Figures 3-2 through 3-6. A typical SVS sampling grid interval is 25 to 50 feet depending upon site geology (Devitt et al., 1987; Chambers and Hennier, 1991; Joyner and Thomsen, 1991; Nielsen, 1991). The grid points are placed in staggered rows to provide a triangular grid pattern, which results in uniform coverage of the target area with equally spaced samples.

In the second phase of the SVS program, sampling grid intervals will be reduced to no tighter than 5 feet at the zone(s) displaying the highest concentrations by the use of additional sampling points to further define potential contaminant source areas. The use and placement of additional sample points will be determined by the EG&G Project Manager and will be based on the Phase I results. Depending upon the source configuration, deeper samples may be required (at the direction of the EG&G Project Manager) at the Mound Area. This contingency was developed because surface soil at the Mound Area IHSS No. 113 has been disturbed and/or removed; however, there is evidence of a release due to high concentrations of dissolved

## Table 3-1

## Soil Vapor Survey Program
## Data Quality Objectives

1. **DATA USES/USERS:**

Soil gas samples will be analyzed in an on-site mobile laboratory to provide qualitative data on VOCs in the unsaturated zone at each of five locations within OU2. Data will be used by the EG&G Project Manager to locate historical contaminant release points. These data will be used to locate the pilot unit vapor extraction wells.

2. **DATA TYPES**

- Systematic grab samples of soil gas along an established grid.

3. **DATA QUALITY**

a) Prioritized data uses:
- Location of contaminant release points
- Location of pilot unit vapor extraction wells

b) Appropriate analytical level
- Level II - mobile laboratory GC – this level of quality is required because this is a screening effort. Level II is characterized by the use of portable analytical instruments or immobile laboratories stationed near a site.

c) Analytes
- Carbon tetrachloride, TCE, and PCE – others contaminants may be present; however, it is not necessary to quantify them for this effort.

d) Required detection limit
- 20 ppbV per analyte

4. **DATA QUANTITY**

- Baseline sampling grid for primary sites (119 soil gas samples):
  - IHSS No. 112 - 64 samples
  - IHSS No. 113 - 33 samples
  - IHSS No. 110 - 22 samples

## Table 3-1 (Continued)

## Soil Vapor Survey Program
## Data Quality Objectives

- Baseline sampling grid for alternate sites (36 soil gas samples);
  - IHSS No. 109 - 14 samples
  - IHSS No. 111.1 - 22 samples

- Thirty-one (20%) additional shallow samples at each of the primary and alternate SVS sites to expand grid or increase grid density on-site, depending on results from initial samples.

- Up to 10 deeper samples at the Mound Area.

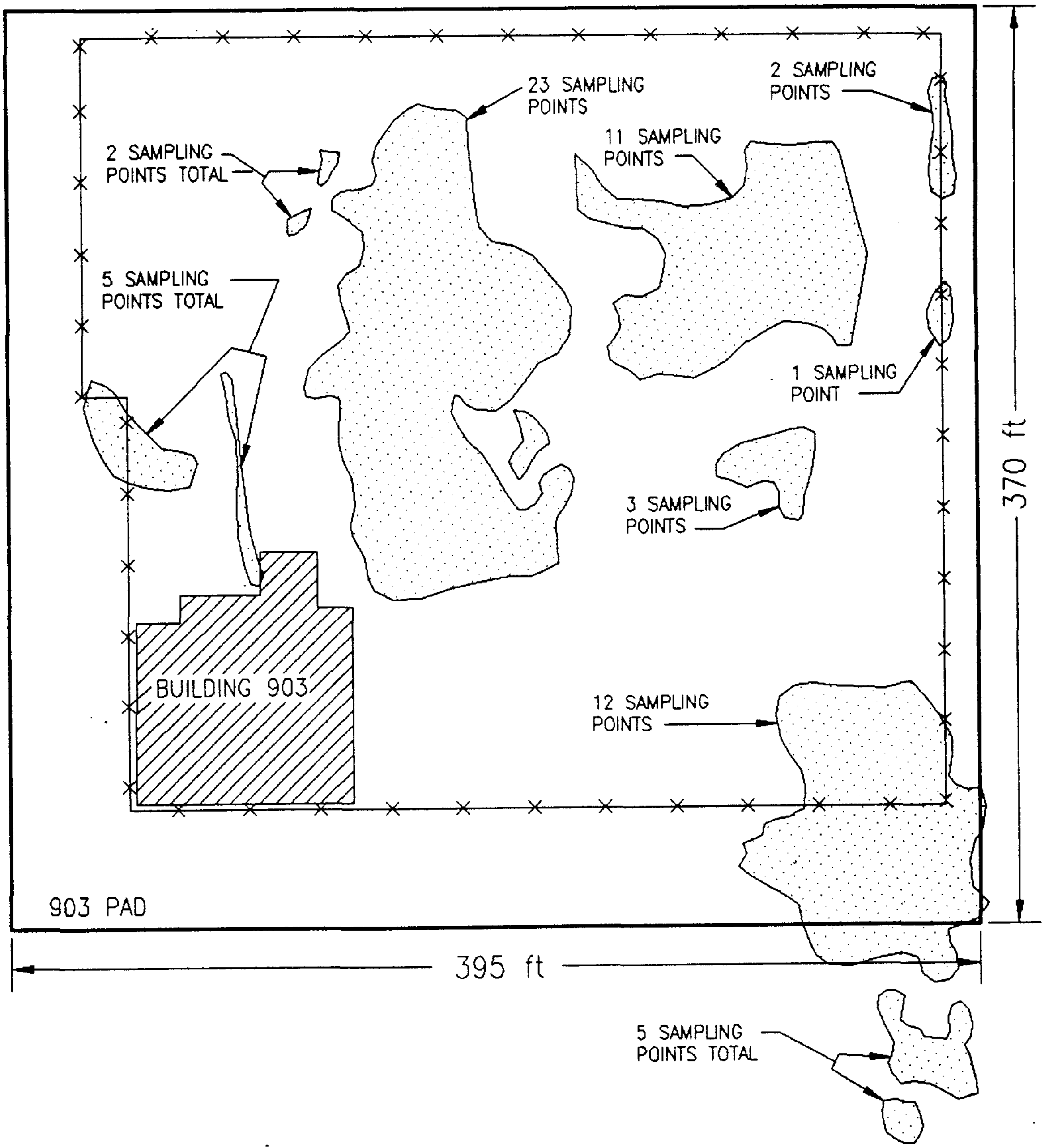
### 5. SAMPLING AND ANALYSIS APPROACH

Shallow soil gas samples will be collected by inserting soil probes to a depth of 3 to 5 feet. Each sample will be collected and analyzed for carbon tetrachloride, PCE and TCE within 2 hours.

### 6. PARCC PARAMETERS

a) Precision
   - Field duplicate ± 20% RPD[a]
   - Replicate analysis ± 10% RPD
b) Accuracy
   - Use of calibration standards in laboratory provides accuracy ± 20% RPD.
   - Analysis once per day of an independently prepared gas standard ± 30% RPD.
c) Representativeness
   - Adherence to sampling procedures specified in this Plan.
d) Completeness
   - Laboratory completeness 95%
   - Field completeness 90%
e) Comparability
   - Adherence to analysis procedures specified in this Plan. Analysis techniques will not change throughout the course of the program.

[a] RPD - relative percent deviation




AREAS OF PROPOSED SOIL VAPOR SAMPLING POINT* – 30 FT SPACING, STAGGERED

IHSS – INDIVIDUAL HAZARDOUS SUBSTANCE SITE

* PROPOSED SAMPLING LOCATIONS BASED ON AREAS OF SOIL STAINING APPARENT IN AERIAL PHOTOGRAPH.

SCALE: 1 INCH = 69 FEET

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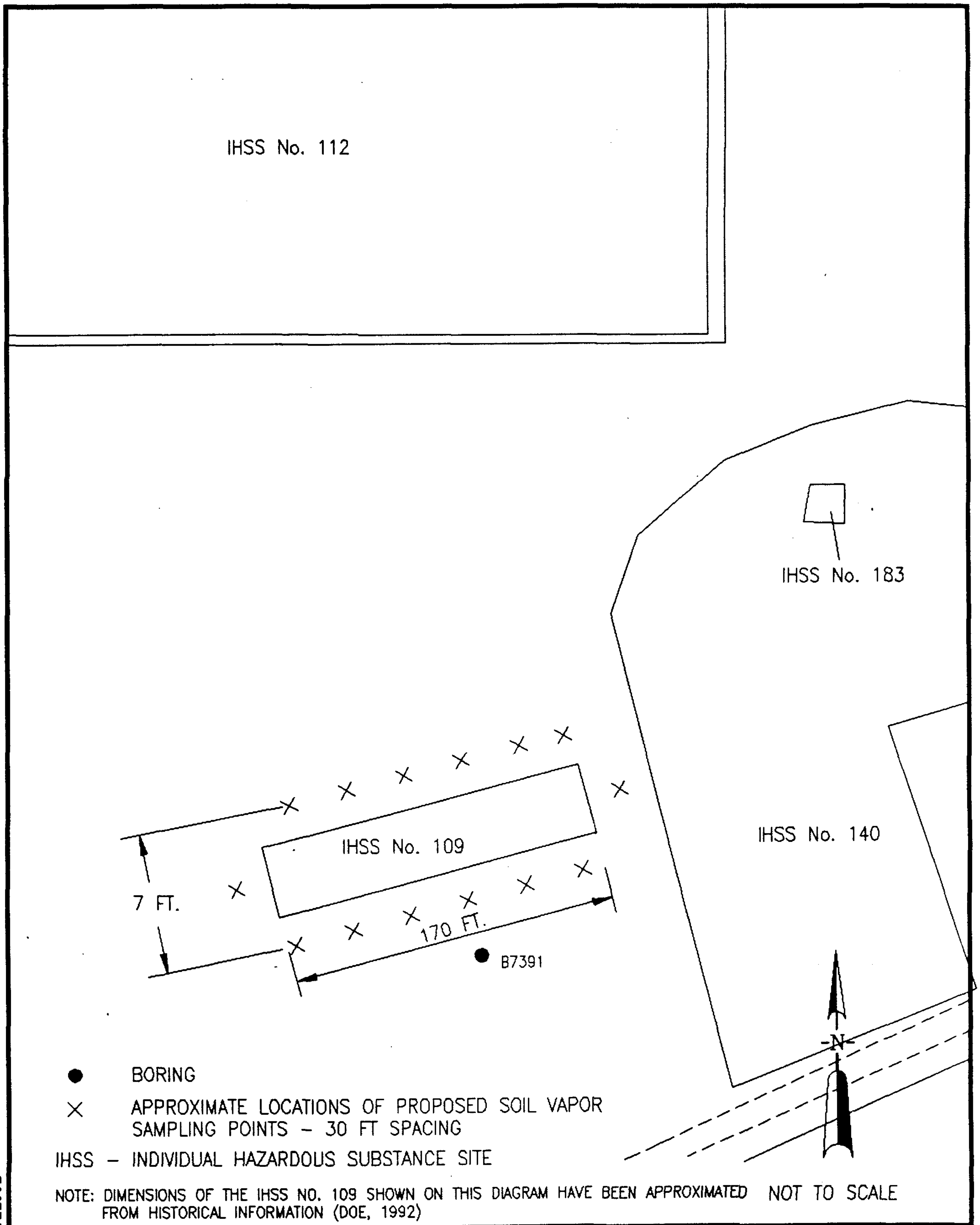
| U.S. DEPARTMENT OF ENERGY<br>Rocky Flats Plant<br>Golden, Colorado | SOIL VAPOR SURVEY SAMPLING LOCATIONS<br>903 PAD<br>IHSS No. 112 | FIGURE<br>3-2 |
|---|---|---|

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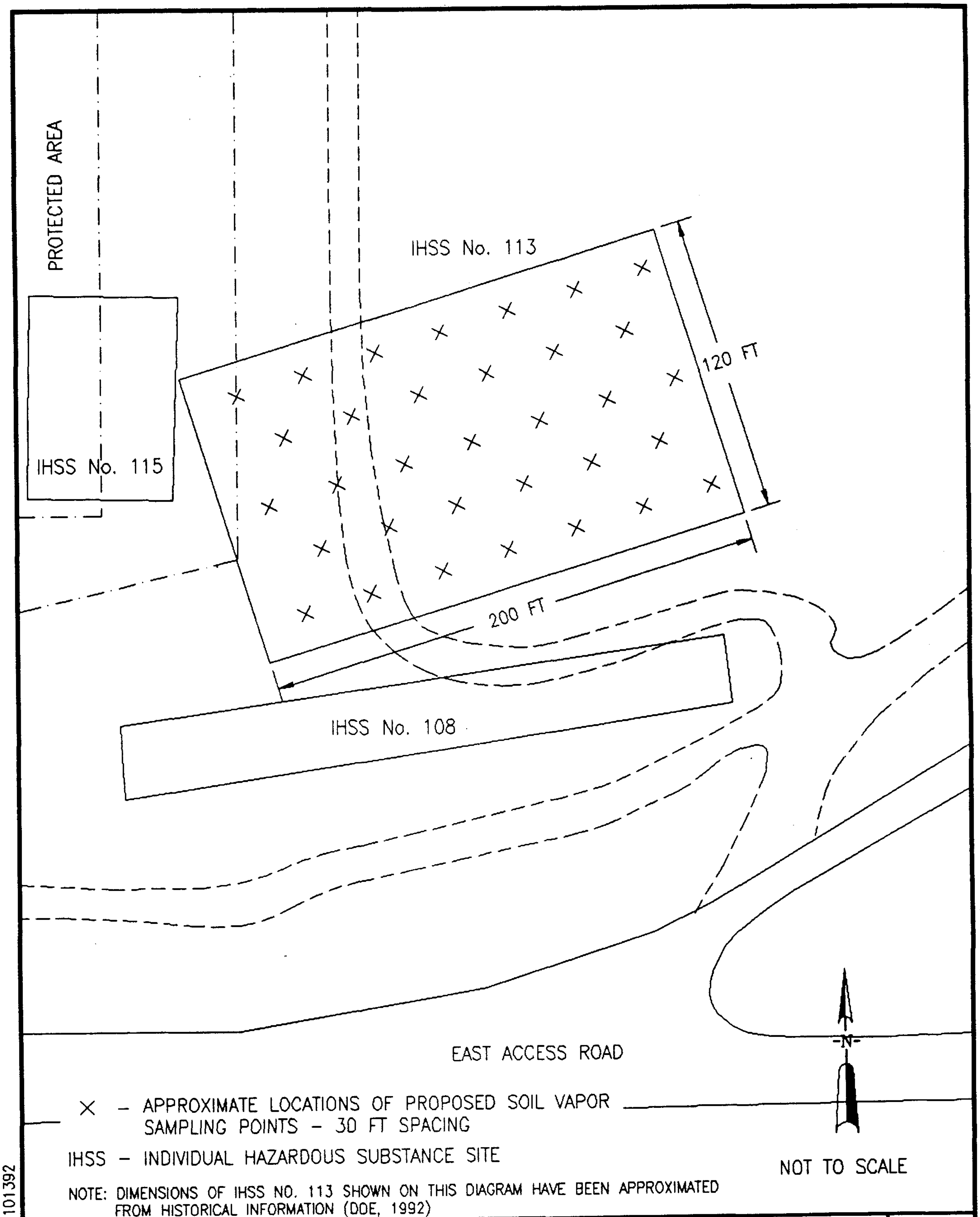
| U.S. DEPARTMENT OF ENERGY<br>Rocky Flats Plant<br>Golden, Colorado | SOIL VAPOR SURVEY SAMPLING LOCATIONS<br>903 PAD AREA<br>IHSS No. 109 | FIGURE<br>3-3 |
|---|---|---|

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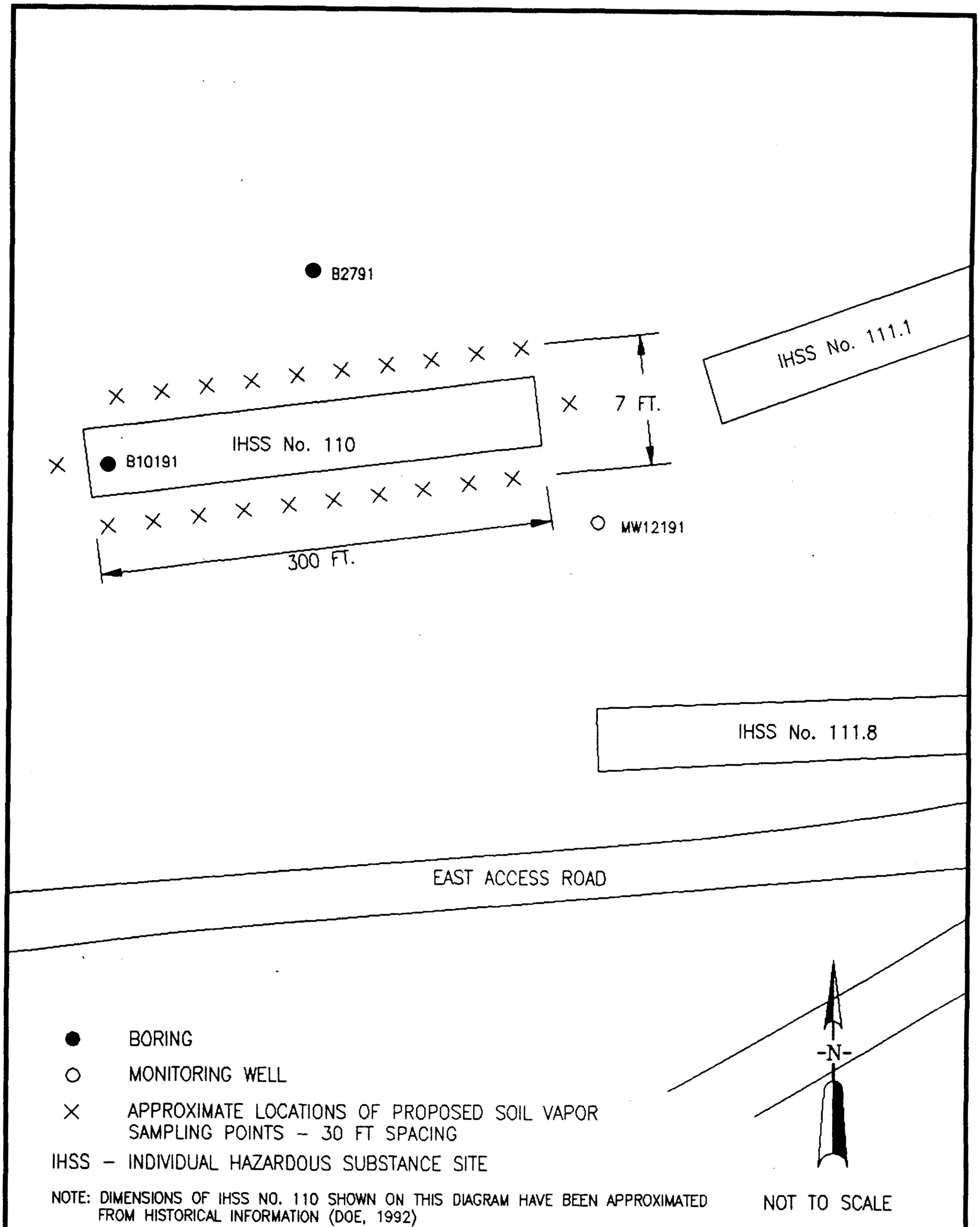
| U.S. DEPARTMENT OF ENERGY<br>Rocky Flats Plant<br>Golden, Colorado | SOIL VAPOR SURVEY SAMPLING LOCATIONS<br>MOUND AREA<br>IHSS No. 113 | FIGURE<br>3-4 |
|---|---|---|




| U.S. DEPARTMENT OF ENERGY<br>Rocky Flats Plant<br>Golden, Colorado | SOIL VAPOR SURVEY SAMPLING LOCATIONS<br>EAST TRENCHES AREA<br>IHSS No. 110 | FIGURE<br>3-5 |
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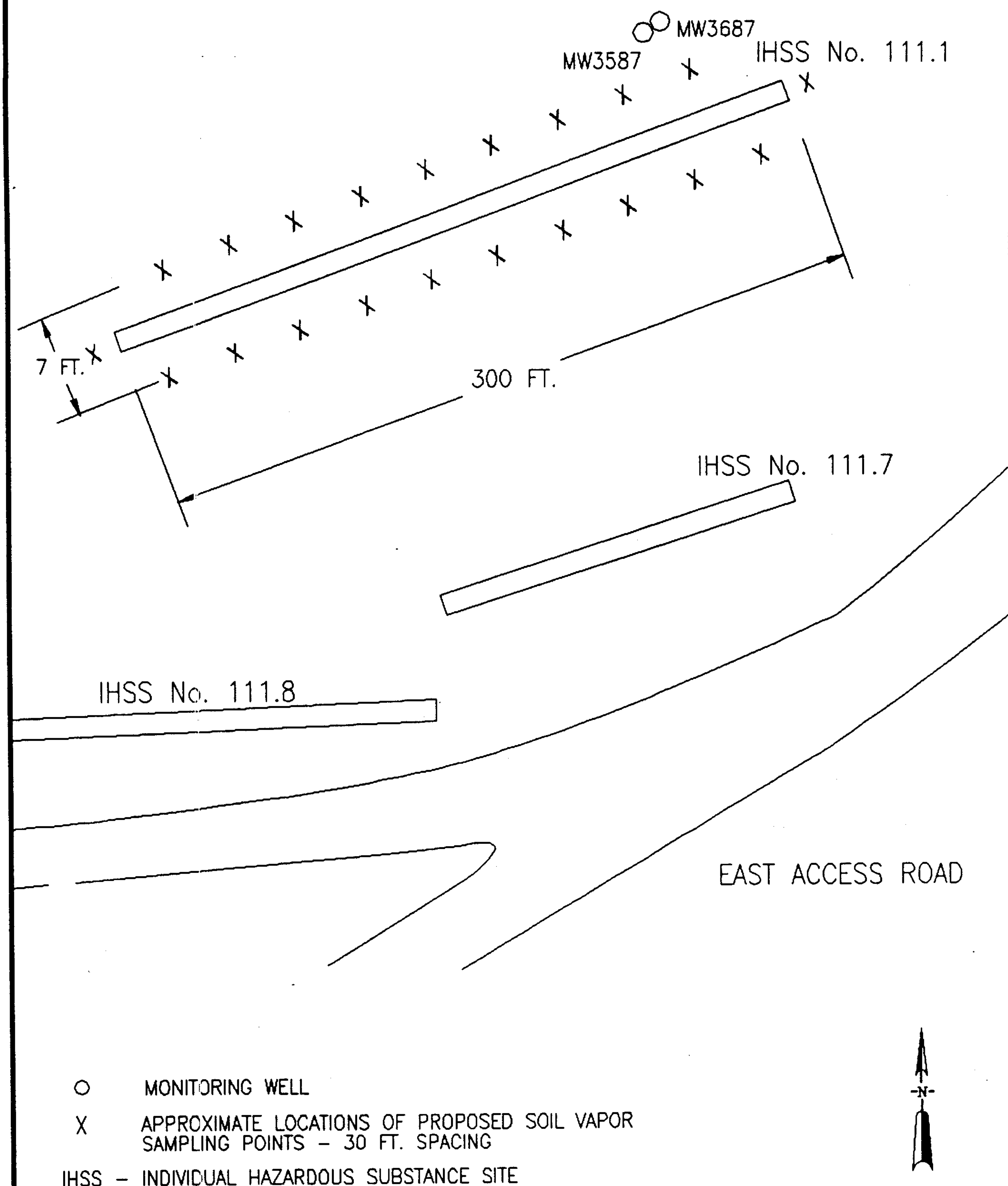



NOTE: DIMENSIONS OF IHSS NO. 111.1 SHOWN ON THIS DIAGRAM HAVE BEEN APPROXIMATED FROM HISTORICAL INFORMATION (DOE, 1992)

NOT TO SCALE

| U.S. DEPARTMENT OF ENERGY<br>Rocky Flats Plant<br>Golden, Colorado | SOIL VAPOR SURVEY SAMPLING LOCATIONS<br>EAST TRENCHES AREA<br>IHSS No. 111.1 | FIGURE<br>3-6 |
|---|---|---|

R37073.PJ-122892

contaminants found in a nearby well (No. 0174) (EG&G, 1992). A deeper soil gas sample taken near the bedrock surface, at the same elevation as the screened interval (10 feet bgs) might detect contaminants not present in the surface soils.

A total of 155 sampling points will be required to obtain a 30-foot grid spacing for baseline sampling at the five sites. Of these sampling points, 64 points will be required at IHSS No. 112, 33 points at IHSS No. 113, 22 points at IHSS No. 110, and 14 points at IHSS No. 109. Additional sampling points (up to 20% of the Phase I sampling points) will be used to better characterize potential contaminant source areas, as necessary. Up to 10 additional deep sampling points (approximately 10 feet bgs) at the Mound Area will be used if shallow samples contain no contaminants.

### 3.3.1 903 Pad Area (IHSS No. 112)

The 903 Pad covers an area of approximately 395 feet by 370 feet (Figure 3-2). Aerial photographs of the 903 Pad taken on 29 April 1967, 10 April 1968, and 24 May 1969 (DOE, 1992) indicate areas of soil staining. The SVS will concentrate on these stained areas (Figure 3-2) because they are suspected to represent contaminant release points. A grid consisting of 64 sample points has been designed to cover these stained areas. The largest stained area in the center of the site will be covered by 23 sample grid points. The small stained areas to the west may be covered by 7 points. The large stained area to the east will require 11 points with surrounding smaller areas requiring an additional 3 points. The remaining 20 points will be used to address the southern area. A grid spacing of 30 feet will be utilized initially and may be augmented, at the direction of the EG&G Project Manager, with up to 12 additional sampling points based on the soil gas analytical results from the Phase I survey.

### 3.3.2 903 Pad Area (IHSS No. 109)

IHSS No. 109 is approximately 70 feet long and 3 feet wide (Figure 3-3). Soil vapor sample points will be placed directly on either side of the trench. A total of 14 points will be used with a spacing of 30 feet. This grid may be augmented, at the direction of the EG&G Project Manager, with up to 3 additional sampling points to further define contaminated areas.

### 3.3.3 Mound Area (IHSS No. 113)

The Mound Site (IHSS No. 113) covers an area approximately 200 by 120 feet (Figure 3-4). A total of 33 sample points will cover the entire area of IHSS No. 113 at 30 foot spacing. The grid spacing may be augmented, at the direction of the EG&G Project Manager, with up to 7 shallow sampling points based upon Phase I SVS analytical results. In addition, up to 10 deeper (10 foot depth) sampling points may be used to identify contamination at the bedrock/alluvial contact at the discretion of the EG&G Project Manager.

### 3.3.4 East Trenches Area (IHSS No. 110)

IHSS No. 110 is approximately 300 feet long and 3 feet wide (Figure 3-5). Soil vapor sample points will be placed directly on either side of the trench with a spacing of 30 feet. A total of 22 points will be used with a spacing of 30 feet. This grid may be augmented, at the direction of the EG&G Project Manager, with up to 5 additional sampling points to further define contaminated areas.

### 3.3.5 East Trenches Area (IHSS No. 111.1)

IHSS No. 111.1 is approximately 300 feet long and 3 feet wide (Figure 3-6). Soil vapor sample points will be placed directly on either side of the trench. A total of 22 sample points will be used to surround the perimeter of the trench; therefore, 10 sample points will be placed down each side of the trench and 1 sample point will be placed at each end. The grid spacing may be augmented, at the direction of the EG&G Project Manager, with up to 5 additional sampling points based upon Phase I SVS results.

## 3.4 EQUIPMENT

This subsection provides a list of the basic field and analytical equipment used to conduct the SVS. This list is intended to provide examples of the types of equipment that may be required and, as such, may not be a comprehensive equipment list There are a number of SVS sampling techniques and equipment that have been developed in recent years that will provide equivalent results. The actual equipment used will depend on the SVS methods employed. It is required, however, that the SVS methods and equipment used will meet the SVS Program DQOs set forth in Section 3.1.

### 3.4.1 Sampling Equipment

- Portable or truck-mounted driver for soil probes.
- Slam bar to prime hole (if soil probe refusal is met).
- Soil probe.
- Drive tips.
- Teflon tubing.
- Assembly to connect Teflon tubing to soil probe.
- Teflon septa.
- Vapor sampling pump.
- Vacuum gauge sized for pump operating range.
- Flow meter
- Gas-tight glass sampling syringes.

Sampling equipment will be made of materials such as Teflon, which will not compromise sample quality.

### 3.4.2 Mobile Laboratory Equipment

The mobile laboratory equipment specified is only an example of the kind of equipment needed to meet the DQOs. Other equipment may be substituted if it can meet the DQOs.

- Mobile laboratory van.

- Programmable gas chromatograph (GC), with photoionization detectors (PID), electron capture detector (ECD), or other detector with comparable performance.

- GC carrier gases.

- Laboratory oven, as necessary.

- Generator with an exhaust tube to prevent exhaust gases from entering the mobile lab.

- Analytical standards.

Mobile laboratory equipment should be capable of attaining Level II analytical data quality. Pumps, tubing, and purge gases should be sufficiently inert to meet SVS program DQOs.

## 3.5 PROCEDURES

The following procedures are an example of those often used to conduct SVS programs. This discussion covers both field sampling procedures and analytical procedures. There are a number of soil gas sampling techniques and equipment that have been developed in recent years that will provide equivalent results. Procedures that will provide equivalent results may be substituted as long as the DQOs of the SVS are met (see Section 3.1). Several procedures or methods described in the following sections are considered essential elements of the SVS program and are so noted.

### 3.5.1 Pre-Field Sampling Tasks

The portable laboratory will be mobilized to the site with all necessary equipment, instrumentation, and manpower approximately 48 hours prior to the beginning of the sampling program. The laboratory will be set up, and the instrumentation powered up, allowed to stabilize, and then calibrated prior to soil gas sampling and analyses. During this period, the planned grid locations for Phase I soil gas collection points will be flagged. Each location will be given a unique sample identification number, described in the logbook and mapped on the site map. The EG&G project manager will inspect and approve the marked sample locations before any soil gas samples are collected.

### 3.5.2 Field Sampling Procedures

Shallow sampling to depths of 3 to 5 feet will be accomplished by driving a soil probe into the ground using a truck-mounted or portable driver or equivalent. In order to penetrate asphalt (present at IHSS No. 112) it may be necessary to first drill a hole before driving the probe. Sample depth may be limited by the presence of cobbles in the subsurface. If hole refusal is encountered, it may be necessary to drive a preliminary hole into the soil with a "slam bar", and then insert a soil probe into the hole. The diameter of the slam bar should be less than the soil probe to ensure a tight seal. If refusal is met using the "slam bar", a second and third attempt will be made within 3 feet of the original location before moving to the next pre-designated sampling location. After the soil probe has been driven, the probe will be lifted a few inches allowing the drive tip to drop, and gas to enter the probe. Teflon tubing will be attached to the top of the soil probe. A Teflon septum (or a gas sampling bulb, depending on the sampling method used) will be attached to the Teflon tubing and a vacuum gauge, flow meter, and flow control valve will be installed downstream of the septum. The vacuum pump will be turned on and used to evacuate at least 3 probe volumes of air using the measured flow rate to calculate the required evacuation time. With the vacuum pump running, a gas tight syringe is inserted through the septum (Figure 3-7). The syringe will be purged several times with soil gas after which a soil gas sample will be collected. The syringe will then be removed from the septum, the end of the needle plugged, and the sample delivered to the mobile laboratory for analysis. Sample preservation/shipment and chain of custody forms will not be required, since the analysis will be done onsite with a mobile laboratory.

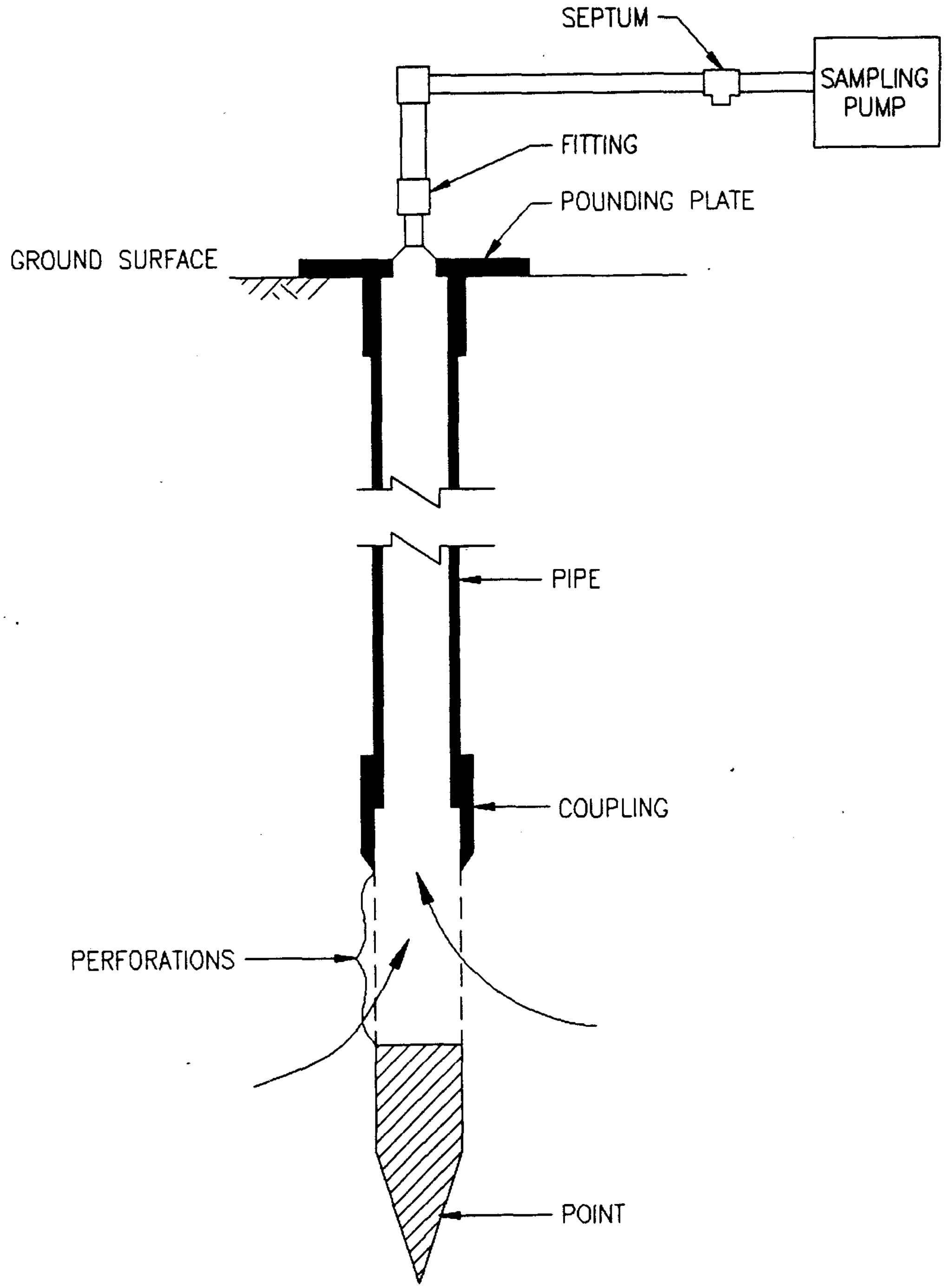
The vacuum pump will then be turned off and the probe removed from the ground using a hydraulic puller mechanism on the probe driver. The used probe will be stored separately from the clean probes, for later decontamination. The probe holes will be backfilled with a thin bentonite slurry to the extent practical. A requirement for work conducted at IHSS No. 112 (903 Pad) includes installing a surface seal compatible with and equal in thickness to the existing asphalt cap.

### 3.5.3 Documentation

A laboratory log notebook and a field log notebook will be maintained during the time that sampling and analyses are conducted. A copy of the log notebooks will be provided to EG&G after the completion of the project.

#### 3.5.3.1 Contents of Field Log Notebook

The field log notebook will include, but not be limited to, the following information:




NOT TO SCALE

| | | |
|---|---|---|
| U.S. DEPARTMENT OF ENERGY<br>Rocky Flats Plant<br>Golden, Colorado | SOIL VAPOR SAMPLING<br>PROBE DESIGN | FIGURE<br>3-7 |

R37076.MBCW-082692

- Time (military notation).
- Sample number.
- Location (approximated description).
- Sampling depth.
- Volume purged from sample probe.
- Inches of mercury on vacuum pump gauge.
- Probe and adaptor identification numbers.
- Observations (i.e., ground conditions, paving type, soil appearance, surface water, odors, vegetation, etc.)
- Back-fill procedure and materials.
- Sample location marked on site map.

#### 3.5.3.2 Contents of Laboratory Log Notebook

The laboratory log notebooks will include, but not be limited to, the following information:

- Time (military notation).
- Sample number.
- Location (approximated description).
- Sampling depth.
- Type of sample (blank, duplicate, etc.).
- Observations (instrument performance, procedures to meet calibration range, etc.).

### 3.5.4 Project QC Procedures

The following requirements are necessary to comply with the stated project DQOs.

## QC Requirements

- A GC or gas chromatograph/mass spectrometer (GC/MS) for analysis of samples. A PID, and ECD, (or detector with comparable performance) will be required for each GC.

- A sufficient number (minimum of 20) of glass syringes or other suitable sampling containers for the purpose of soil gas sampling and injection of sample into an analytical instrument. Stainless-steel hypodermic syringe needles equipped with a shut-off valve (for sample isolation) shall be required if glass syringes are utilized for sampling and injection purposes.

- A log of each sampling point will be kept and shall contain, at a minimum, the following: time and date (military notation); sample location; sample number; sampling depth; purge time before sampling; inches of mercury on vacuum pump during purge; surface conditions during sampling (surface covering, standing water, etc.,); backfill procedure and materials.

- The first sample to be analyzed each day will be a field blank: the field blank will be obtained by collecting a sample of ultra high purity (UHP) air through each sampling system. The field blank analysis must show a level less than one-half of the nominal detection limit for each halogenated species before sampling can begin. If these levels cannot be achieved, all sampling syringes will be blank checked before use.

- At 10 percent of the soil gas sampling locations, a replicate field sample will be collected and analyzed. The replicate will be taken at the same location as the original sample (i.e., from the same probe).

- An EG&G representative will have access to the on-site sampling and analysis vehicle to observe analytical methods and procedures.

- A four-point calibration will be performed on each GC at the start of each week using standards containing the following compounds: carbon tetrachloride, TCE and PCE. A response factor (R.F.) will then be determined for each of compounds using a linear regression. The correlation coefficient for each of the compounds must be >0.99 or the calibration must be repeated.

- An analytical blank will be analyzed following the daily calibration by injection of UHP nitrogen in to the instrument. This blank must show levels equal to or less than the criteria for a field blank. If necessary, the analytical blank is repeated until this level is achieved.

- Ten percent of the soil gas samples shall be analyzed by replicate injection. The relative percent difference (RPD) for all detected analytes is calculated and documented. The RPD of the two most concentrated species for duplicate injections must be less than 20 percent or a third injection is required. Soil gas samples which require dilution may require a fourth run to check reproducibility. The results from the third injection (or fourth in the case of a diluted sample) determine subsequent action as follows. If the data from the final injection results in RPDs of less than 50 percent (for the two most concentrated species), sample analysis may continue. However, it is imperative that associated data points from all samples analyzed since the last replicate (or daily QC check if this is the first replicate of the day) are flagged to note this excessive variability. If the RPDs using the third injection are greater than 50 percent for either of the two most concentrated species, immediate corrective action is required (i.e., stop sample analysis, locate source of problem, conduct system maintenance as needed). A mid-level gas standard must then be analyzed as described below under "QC check sample."

- Five percent of the field locations will take a field duplicate sample within 2 feet of the original sample location.

- A GC system blank of UHP air shall be injected following samples which have levels above the calibrated range. The system blank shall be repeated until levels fall below 10 ppbv.

- A soil gas sample which contains a calibrated compound at a concentration above the calibrated range shall be diluted and rerun to bring it within the calibrated range.

- A QC check sample which shall be a standard in the middle of the calibrated range will be the last run of the day to determine drift on the instrument. Recoveries will be calculated for each compound and recorded on the daily report sheet. If recoveries are not within 70 to 130 percent of the true value for a compound, then the data will be flagged for that compound.

- On days that a multipoint calibration is not performed, a QC check sample shall be done as the first run of the day. Recoveries will be calculated and recorded as described above. If recoveries are not within 70 to 130 percent of the true value for all but one calibrated compound, the multipoint calibration is repeated.

- An analysis report sheet will be prepared to report the following data at the end of each work day:

  - Daily R.F. for each calibrated compound
  - Correlation coefficient for each compound
  - System blank levels in ppbv
  - Ambient blank levels, when required.
  - Field blank levels in ppbv
  - Field I.D. and concentration in ppbv of calibrated compounds for each soil gas sample run that day.
  - Volume injected for each sample, if syringe injection is used, and time of analysis.
  - Percent recovery for each compound in the QC check sample.
  - RPDs for duplicate analyses.
  - Unidentified peaks reported with nearest calibrated compound.

- Analyses shall be performed for the following compounds:

  - carbon tetrachloride
  - TCE
  - PCE

- Subcontractor shall submit written results for each days analyses by 10 a.m. on the following working day.

- Detection limits for on-site GC analysis are required as follows:

| COMPOUND | METHOD DETECTION LIMIT |
|---|---|
| carbon tetrachloride | 20 ppbv |
| TCE | 20 ppbv |
| PCE | 20 ppbv |

- The QA/QC requirements are written based on syringe sampling and on-site GC analysis with PID and ECD detectors. Alternative methods of sampling and analysis that are equivalent to the above described methods may be submitted for consideration.

## 3.6 DECONTAMINATION

Equipment decontamination will be conducted in accordance with Rocky Flats Plant SOP FO.03, General Equipment Decontamination and FO.04, Heavy Equipment Decontamination. These procedures should be considered minimum requirements as sampling equipment will be decontaminated to the extent necessary to conform to the quality control objectives.

## 3.7 MANAGEMENT OF INVESTIGATION-DERIVED WASTES

Investigation-derived wastes will consist of decontamination wastes from cleaning sampling materials, personal protective equipment, and disposable sampling equipment. It is important that different types of investigation-derived wastes are kept separate. Personal protective equipment will be handled separately under SOP FO.06, Handling of Personal Protective Equipment. Decontamination water and wash water should be containerized according to SOP FO.07, Handling of Decontamination Water and Wash Water. If cuttings are generated during the SVS (this is not expected), they should be containerized and handled according to SOP FO.08, Handling of Drilling Fluids and Cuttings. The procedures to be followed for containerizing liquid and solid wastes are specified in SOP FO.10, Receiving, Labeling, and

Handling of Environmental Material Containers. If residual samples are generated (this is not expected), they should be handled according to SOP FO.09, Handling of Residual Samples.

In addition, many of the procedures specified in the previously mention SOPs require the use of the RFP Main Decontamination Facility for the screening, and disposal of different types of wastes. There are special procedures to be followed in using this facility which are described in SOP FO.12, Decontamination Facility Operations. Any situations which may arise which are not covered by the previously mentioned SOPs should be immediately brought to the attention of the EG&G Project Manager for further guidance.

# SECTION 4
# DATA REPORTING AND ANALYSIS

## 4.1 DATA EVALUATION IN THE FIELD

The use of the mobile laboratory will allow collection of real-time analytical results (i.e., within 2 hours after the sample is taken). The Phase I grid sampling locations are based upon 30-foot intervals. If the analytical data generated during the Phase I SVS indicate the presence of high levels of VOCs in certain locations, this information will be used to locate additional Phase II soil gas sampling points in coordination with the EG&G Project Manager at up to three distinct locations displaying the highest concentrations within a given IHSS. During Phase II sample spacing may be reduced to but no less than 5 feet to better define the configurations of the contaminant source areas. At IHSS No. 113, deeper samples may be taken, if the analytical data indicates that no concentrations of VOCs are present in shallow soil gas. Deep samples will be used to confirm the presence or absence of residual DNAPLs at the bedrock contact.

## 4.2 DATA REPORTING REQUIREMENTS

The final project report will include each of the following elements for the SVS conducted at each site:

- Procedures used.
- Maps of surveyed sample locations including location of sample refusals. Horizontal control will be established on sample location to 1.0 foot.
- Soil vapor VOC concentration and depth data.
- Quality Control results with a narrative summary of compliance with QC procedures.
- VOC isoconcentration contour maps.

## SECTION 5

## REFERENCES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# APPENDIX A

# QUALITY ASSURANCE ADDENDUM

Approved by:

_____________________ ___/___/___ _____________________ ___/___/___

Director, Environmental Science & Engineering Project Manager

## QUALITY ASSURANCE ADDENDUM

This Appendix consists of the Quality Assurance Addendum (QAA) for the Soil Vapor Survey Work Plan for the 903 Pad, Mound, and East Trenches Area (Operable Unit No. 2 [OU2]). This QAA supplements the "Rocky Flats Plant Site-Wide Quality Assurance Project Plan for CERCLA Remedial Investigation/Feasibility Studies and RCRA Facility Investigations/Corrective Measures Studies Activities" (QAPjP). The QAA establishes the site-specific Quality Assurance (QA) controls applicable to the investigation activities described in the Soil Vapor Survey Work Plan (SVS WP).

Five Individual Hazardous Substance Sites (IHSSs) within the OU2 boundary have been targeted for testing a vapor extraction system (VES), which is designed to remove free-phase volatile organic compounds (VOCs) in situ. The soil vapor survey described in the SVS WP will provide information on the location of residual free-phase VOCs in the subsurface beneath the IHSSs, which will assist in determining the locations for installation of the VES. The SVS WP describes the IHSS locations to be surveyed, the criteria and rationale for the site sampling grid designs, sampling procedures and analytical methods, and the methods to evaluate and report data collected.

### A.1 ORGANIZATION AND RESPONSIBILITIES

The overall organization of EG&G Rocky Flats and the Environmental Restoration (ER) Management Organization responsible for implementing the ER Program activities at the DOE

Rocky Flats Plant (RFP) is presented in Section 1.0 of the QAPjP. Functional responsibilities are also described in Section 1.0 of the (QAPjP).

## A.2 QUALITY ASSURANCE PROGRAM

The QAPjP was written to address QA controls and requirements for implementing ER Program activities, as required by the RFP Interagency Agreement (IAG). The content of the QAPjP was driven by Department of Energy (DOE) Order 5400.1, the RFP QA Manual (RF QAM), and the IAG. DOE 5400.1 and the RFQAM both require a QA program to be implemented based on American Society of Mechanical Engineers (ASME) NQA-1, "Quality Assurance Requirements for Nuclear Facilities." The IAG specifies development of a QAPjP in accordance with the Environmental Protection Agency (EPA) QAMS-005/80, "Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans." The 18-element format of NQA-1 was selected as the basis for both the QAPjP and subsequent QAAs with the applicable elements of QAMS-005/80 incorporated where appropriate. Figure 2-1 of Section 2.0 of the QAPjP illustrates where the 16 QA elements of QAMS-005/80 are integrated into the QAPjP and also into this QAA. Section 2.0 of the QAPjP also identifies other DOE Orders and QA requirements documents to which the QAPjP and this QAA are responsive.

The controls and requirements addressed in the QAPjP are applicable to SVS WP activities, unless specified otherwise in this QAA. Where site-wide actions are applicable to SVS activities, the applicable section of the QAPjP is referenced in this QAA. This QAA addresses additional and site-specific QA controls and requirements that are applicable to SVS activities that may not have been addressed on a site-wide basis in the QAPjP. Many of the QA requirements specific to the SVS are addressed in the SVS WP and are referenced in this QAA.

### A.2.1 Training

The minimum personnel qualification and training requirements that are applicable to EG&G and subcontractor staff for RFP ER Program activities are addressed in Section 2.0 of the QAPjP.

All EG&G and subcontractor staff working on OU2 SVS shall be trained in the EM Operating or laboratory analytical procedures that are applicable to their assigned tasks. Subcontractor personnel shall receive training on the requirements of the QAPjP, the SVS WP (including this QAA), and applicable operating procedures. This training must be recorded, with verifiable documentation of training submitted to the EG&G Project Manager prior to implementing the SVS activities described in the SVS WP. EG&G and subcontractor personnel shall also be qualified to perform the tasks they have been assigned. Personnel qualifications must be documented, with documentation of qualification verified by the EG&G Project Manager in accordance with EM administrative procedure 3-21000-ADM-02.02, Personnel Qualifications.

### A.2.2 Quality Assurance Reports to Management

A QA summary report will be prepared annually or at the conclusion of the OU2 SVS activities (whichever is more frequent) by the EG&G Project Manager. This report will include a summary of field operation and sampling oversight inspections, laboratory assessments, surveillance, and a report on data verification/validation results.

## A.3 DESIGN CONTROL AND CONTROL OF SCIENTIFIC INVESTIGATIONS

### A.3.1 Design Control

The SVS WP describes the investigation activities that will be implemented during the SVS to provide information on the location of residual free-phase VOCs in the subsurface beneath the

OU2 IHSSs of interest. The work plan identifies the objectives of the investigations; specifies the sampling, analysis, and data generation requirements; identifies applicable operating procedures that will provide controls for the investigations, and presents the methods to be used to evaluate and report data collected during the implementation of the SVS program. As such, the SVS WP is considered the environmental investigation control plan for the SVS program.

### A.3.2 Data Quality Objectives

The development of Data Quality Objectives (DQOs) for the OU2 SVS program was presented in Section 3.1 of the WP. The DQOs were established in general accordance with the 3-stage process described in EPA/540/G-87/003 (OSWER Directive 9335.0-7B), Data Quality Objectives for Remedial Response Activities, and Appendix A of the QAPjP. Table 3-1 identifies the data uses, data types, data needs, appropriate analytical levels, contaminants of concern, required detection limits, data quantity needs, and the sampling and analysis approach for the OU2 SVS program.

Data quality is typically measured in terms of precision, accuracy, representativeness, comparability, and completeness (also referred to as PARCC parameters). Precision, accuracy, and completeness are quantitative measures of data quality, while representativeness and comparability are qualitative statements that express the degree to which sample data represent actual conditions and describe the confidence of one data set to another. These parameters are defined in Appendix A of the QAPjP. PARCC parameter objectives are established in Table 3-1.

### A.3.3 Sampling Locations and Sampling Procedures

The soil vapor sampling plan is described in Section 3.2 of the SVS WP. Soil vapor sampling points are based on a 15-foot grid covering the IHSSs to be sampled. Sampling intervals may be reduced around points with the highest concentrations to further define potential contaminant source areas. The sampling equipment to be used to collect the soil vapor samples is identified in Section 3.3. Soil vapor samples will be collected at 3 to 5 foot depths following EM Operating Procedure 5-21000-OPS-GT.9, Soil Gas Survey. A general description of the soil vapor sampling procedure is presented in Section 3.4.2 of the SVS WP.

Soil vapor samples shall be collected in glass syringes. Stainless-steel hypodermic needles equipped with a shut-off valve shall be utilized for injection purposes. Sampling syringes and stainless-steel needles shall be sterilized (i.e., decontaminated) between samples by baking them in a forced air oven at 150°C overnight.

### A.3.4 Analytical Procedures

Soil vapor samples will be analyzed on site using a portable gas chromatograph/mass spectrometer (GC/MS). The contaminants of concern and the method detection limits are identified in Section 3.4.4 of the SVS WP.

### A.3.5 Equipment Decontamination

Sampling equipment that is used at more than one location shall be decontaminated between sampling locations in accordance with OPS-FO.03, General Equipment Decontamination. Other equipment (e.g., portable or truck mounted driver) potentially contaminated during sampling shall be decontaminated as specified in OPS-FO.04, Heavy Equipment Decontamination.

### A.3.6 Quality Control

Field sampling and analytical quality control (QC) requirements are described in Section 3.4.4 of the SVS WP.

### A.3.7 Quality Assurance Monitoring

To assure the overall quality of the SVS sampling and analysis activities field oversight inspections will be conducted during the conduct of sampling and analysis.

### A.3.8 Data Reduction, Validation, and Reporting

Data management and reporting requirements for field and laboratory data are discussed in Sections 3.4.3.1 and 3.4.4, respectively.

## A.4 PROCUREMENT DOCUMENT CONTROL

Procurement documents for items and services, including services for conducting field sampling and analysis, shall be prepared, handled, and controlled in accordance with the requirements and methods specified in Section 4.0 of the QAPjP.

## A.5 INSTRUCTIONS, PROCEDURES, AND DRAWINGS

The SVS WP describes the field sampling and analysis activities to be performed. The SVS WP will be reviewed and approved in accordance with the requirements for instructions, procedures, and drawings outlined in Section 5.0 of the QAPjP.

EM OPS approved for use and their applicability are identified in Table A.1. Any additional quality-affecting procedures proposed for use but not identified in Table A.1 will also be developed and approved as required by Section 5.0 of the QAPjP prior to performing the affected activity.

Changes and variances to approved operating procedures and the SVS WP shall be documented through preparation of Document Change Notices (DCNs), which will be prepared, reviewed, and approved in accordance with requirements specified in Section 5.0 of the QAPjP.

## A.6 DOCUMENT CONTROL

The following documents will be controlled in accordance with Section 6.0 of the QAPjP:

- Soil Vapor Survey Work Plan for 903 Pad, Mound, and East Trenches Area (Operable Unit 2), including appendices.
- "Rocky Flats Plant Site-Wide Quality Assurance Project Plan for CERCLA Remedial Investigation/Feasibility Studies and RCRA Facility Investigations/Corrective Measures Studies Activities" (QAPjP)
- EM Operating Procedures (all operating procedures specified in the SVS WP).

## A.7 CONTROL OF PURCHASED ITEMS AND SERVICES

Subcontractors that provide services to support the SVS program activities will be selected and evaluated as outlined in Section 7.0 of the QAPjP. This includes preaward evaluation/audit of proposed subcontractors as well as periodic assessment of the acceptability of contractor performance during the program. Any items or materials that are purchased for use during the SVS sampling and analysis that have the ability to affect the quality of the data should be inspected upon receipt.

## A.8 IDENTIFICATION AND CONTROL OF ITEMS, SAMPLES, AND DATA

Soil gas samples shall be identified and handling, containerizing, shipping, and storage controlled in accordance with EM operating procedure 5-21000-OPS-FO.13, Containerizing, Preserving, Handling, and Shipping of Samples, and Section 3 of the SVS work plan.

Sample chain-of-custody will be maintained through the application of OPS-FO.13 and Section 8.0 of the QAPjP.

## A.9 CONTROL OF PROCESSES

The overall processes of collecting and analyzing samples require control. The processes are controlled by adhering to the SVS WP and the sampling and analytical procedures.

## A.10 INSPECTION

Inspection of SVS activities shall be conducted in accordance with Section 10.0 of the QAPjP.

## A.11 TEST CONTROL

Test control requirements specified in Section 11.0 of the QAPjP are not applicable to any of the SVS program.

## A.12 CONTROL OF MEASURING AND TEST EQUIPMENT (M&TE)

The GC/MS used to analyze soil gas samples should have a file that contains:

- Specific model and instrument serial number

- Operating instructions
- Routine preventative maintenance procedures, including a list of critical spare parts to be provided or available in the field
- Calibration methods, frequency, and description of the calibration solutions
- Standardization procedures (traceability to nationally recognized standards)

## A.13 HANDLING, STORAGE, AND SHIPPING

Samples shall be packaged, transported, and stored in accordance with Section 3 of the SVS WP and 5-21000-OPS-FO.13.

## A.14 STATUS OF INSPECTION, TEST, AND OPERATIONS

The requirements for the identification of inspection, test, and operating status specified in Section 14.0 of the QAPjP do not apply to the SVS program.

## A.15 CONTROL OF NONCONFORMANCES

The requirements for the identification, control, evaluation, and disposition of nonconforming items, samples, and data will be implemented as specified in Section 15.0 of the QAPjP. Nonconformances identified by the implementing contractor shall be submitted to EG&G for processing as outlined in the QAPjP.

## A.16 CORRECTIVE ACTION

The requirements for the identification, documentation, and verification of corrective actions for conditions adverse to quality will be implemented as outlined in Section 16.0 of the QAPjP.

Conditions adverse to quality identified by the implementing contractor shall be documented and submitted to EG&G for processing as outlined in the QAPjP.

## A.17 QUALITY ASSURANCE RECORDS

Field QA records will be controlled in accordance with OPS-FO.02, Field Document Control. QA records to be generated during the SVS program are identified in Sections 3.4.3.1 and 3.4.4 of the SVS WP.

## A.18 QUALITY VERIFICATION

The requirements for the verification of quality shall be implemented as specified previously in Section A.3.7 of this Appendix.

A Readiness Review shall be conducted by the QAPM prior to the implementation of the SVS program. The readiness review will determine if all activity prerequisites have been met that are required to begin work. The applicable requirements of the QAPjP, the SVS WP, and this QAA will be addressed.

## A.19 SOFTWARE CONTROL

The requirements for the control of software is not applicable to the SVS program.